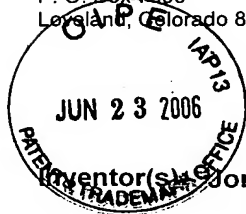


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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s) Jonah A. Harley et al.

Serial No.: 10/664,947

Examiner: Tamai, Karl

Filing Date: September 22, 2003

Group Art Unit: 2834

Title: STEPPING ELECTROSTATIC COMB DRIVE ACTUATOR

COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria VA 22313-1450

TRANSMITTAL OF REPLY BRIEF

Sir:

Transmitted herewith is the Reply Brief with respect to the Examiner's Answer mailed on April 27, 2006. This Reply Brief is being filed pursuant to 37 CFR 1.193(b) within two months of the date of the Examiner's Answer.

(Note: Extensions of time are not allowed under 37 CFR 1.136(a))

(Note: Failure to file a Reply Brief will result in dismissal of the Appeal as to the claims made subject to an expressly stated new grounds of rejection.)

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Respectfully submitted,

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**THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Applicant** : 10/664,947

**Filed** : September 22, 2003

**Title** : STEPPING ELECTROSTATIC COMB DRIVE ACTUATOR

**TC/A.U.** : 2834

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**REPLY BRIEF UNDER 37 C.F.R. §1.193(b)**

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**I. STATUS OF CLAIMS**

Claims 1 and 3-24 are pending in the application. Claim 2 has been canceled. Claims 1 and 3-24 stand rejected. Appellants appeal the rejection of claims 1 and 3-24.



## **II. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

(1) Claims 1, 3-7, 9, 14-17, 22 and 23 stand rejected under 35 U.S.C. § 103(a) as being obvious over Japanese Patent No. 07-274540 issued to Higuchi et al. ("Higuchi") in view of U.S. Patent No. 5,869,916 issued to Suzuki et al. ("Suzuki-916") (See August 16, 2005 Office Action ("Final Office Action"), p. 3, para. 6).

(2) Claims 8, 10-12 and 18-21 stand rejected under 35 U.S.C. § 103(a) as being obvious over Higuchi and Suzuki-916, and in further view of Japanese Patent No. 08-186987 issued to Suzuki et al. ("Suzuki-987") (See Final Office Action, p. 4, para. 7) ; and

(3) Claims 13 and 24 stand rejected under 35 U.S.C. § 103(a) as being obvious over Higuchi and Suzuki 916, and in further view of U.S. Patent No. 5,986,381 issued to Hoen et al. ("Hoen") (See Final Office Action, pp. 8-9, para. 8).

This Reply Brief is filed in reply to the Examiner's Answer dated April 27, 2006, which was filed in response to the Appellants' Appeal Brief filed February 13, 2006. The Examiner's Answer fails to adequately address or overcome Applicant's arguments in support of allowance of the claims.

### III. ARGUMENT

The pending claims are patentable over the cited prior art. Central to each ground of rejection set forth above is the improper combination of Higuchi and Suzuki-916. The rejections set forth by the Examiner must fail because Higuchi and Suzuki-916 cannot be combined. These references, when considered as a whole, do not suggest the desirability of being combined. Rather, these references teach against making such a combination. Further, the Final Office Action fails to indicate where sufficient motivation to overcome these teachings and combine Higuchi and Suzuki-916 can be found in the prior art. Since Higuchi and Suzuki-916 cannot be combined, the prior art references necessarily fail to teach or suggest all of the claim limitations and, therefore, fail to establish a *prima facie* case of obviousness. The pending claims must be allowed.

The Examiner's Answer fails to adequately address or overcome the above arguments. The Examiner's Answer does not cure the defects in the Final Office Action, nor can it. Indeed, the Examiner's Answer misstates the Appellants' arguments and often fails to directly respond to or answer the Appellants' arguments. Moreover, Examiner's Answer makes numerous unsupported and incorrect statements. The lack of an adequate response to each of Appellants' arguments must support the conclusion that Appellants' arguments are correct.

#### A. **The Examiner's Answer Fails To Overcome Appellants' Showing That Higuchi And Suzuki-916 Do Not Suggest The Desirability And Therefore The Obviousness Of Being Combined As Is Required By Law**

As noted in Appellants' Appeal Brief, Higuchi and Suzuki-916 fail to suggest the desirability and thus the obviousness of being combined, as is required by law. *See Appeal Brief*, p. 10 (citing *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5 (Fed. Cir. 1986) (the references *must suggest* the desirability and thus the obviousness of making the combination); see, also, *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)).

In demonstrating that Higuchi and Suzuki-916 fail to suggest the desirability of the combination, the Appellants showed that the proposed combination of Higuchi and Suzuki-916 would render Higuchi unsatisfactory for its intended purpose. *See Appeal Brief*, pp. 11-

12. It is well-settled law that if a combination would render the prior art being modified (Higuchi) unsatisfactory for its intended purpose, then there is no suggestion to make the proposed combination. *Id.* (citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); see, also, MPEP 2143.01). Appellants' plainly showed that Higuchi's intended purpose is directed to improved electrostatic motors driven by *alternating-current (AC) voltages*. *Id.* Indeed, the "Field of Industrial Application", "Prior Art", "Problems to be Solved by the Invention", "Means for Solving the Problem" and each and every claim of Higuchi are directed to an "electrostatic motor" in which a "alternating-current is applied thereto." See Higuchi, pp. 2-17. Combined with Suzuki-916 as proposed by the Examiner, Higuchi's electrostatic actuators would be driven by DC voltages; Higuchi would not be directed to electrostatic motors driven by AC voltages and, therefore, would be rendered unsatisfactory for its intended purpose. Consequently, the combination of Higuchi and Suzuki-916 must fail.

In response to the Appellants' showing, the Examiner's Answer seeks to divorce the use of AC voltages from Higuchi's stated purpose. See *Answer*, p. 8. As the evidence cited above clearly shows, the Examiner's argument has no basis. Rather, Higuchi makes clear that its intended purpose is directed to improved electrostatic motors driven by AC voltages. See *Higuchi*, p. 24 "Advantages of the Invention" ("...the following advantages can be manifested according to the present invention...An electrostatic motor, in which...a 3-phase or 4-phase alternating current is applied, is provided with an electrode structure in which 3-phase electrodes or 4 phase electrodes are formed on both sides thereof; hence, the stress...is equalized...and an improvement in the force density can be engineered"). The plain words of Higuchi make clear that Higuchi's purpose requires AC voltages be applied. The Examiner's Answer provides no support for divorcing the application of AC voltages from Higuchi's intended purpose, nor can it.

Likewise, the Examiner's Answer provides no support for its statement that Higuchi's "purposes are achieved whether the traveling wave set up in the electrodes is established by a DC or an AC source" (*Answer*, p. 8), nor can it. Higuchi does not teach that its purposes can be achieved with a DC source. Rather, Higuchi only speaks of electrostatic motors driven by AC voltages and "*the alternating current waveform*." See *Higuchi*, p. 24. The teachings of improved electrostatic motors are intertwined throughout Higuchi with the required use of AC voltages. Stated another way, Higuchi *only* teaches that its purpose may be achieved electronic motors driven with AC voltages. Higuchi does not teach that its improvements are

capable of being achieved with DC driven actuators, let alone beneficial to DC driven actuators, as asserted by the Examiner's Answer. See *Answer*, p. 7. Furthermore, the Examiner provides no support for his assertion that the "traveling wave" can be established by a DC source.

In attempting to support its argument, the Examiner's Answer cites to paragraph 0038 of Higuchi. Rather than supporting the Examiner's argument, this paragraph further proves that Higuchi's purpose requires AC voltages. Paragraph 0038 follows a description of four different practical examples and notes that the invention is not limited to those four practical examples and that various modifications are possible. See *Higuchi*, p. 24. The paragraph then goes on to state that "the number of phases supplied to the electrodes and *the* alternating current waveform may be changed in various ways." *Id.* (emphasis added). Higuchi makes clear that an AC voltage must be used by referring to "*the*" AC waveform. If Higuchi contemplated any other voltage source, such as a DC source, it would not have said "the" AC waveform. Indeed, if Higuchi intended for anything other than an AC voltage to be used, such as a DC voltage, it would have likely stated so in paragraph 0038. Higuchi does not so state, here or elsewhere.

The Examiner's Answer includes some additional misstatements in attempting to overcome this argument. For example, the Examiner's Answer states that "Suzuki [Suzuki-916] is combined to shown [sic] a known way of driving an AC electrostatic actuator is with a DC Voltage to provide five types of polarities and voltages to control the movement of the mover left and right in a smooth movement." See p. 7. Suzuki-916 does not show a way, known or otherwise, of driving an AC electrostatic actuator with DC voltage. Neither the cited portion of Suzuki-916 (*i.e.*, col. 10, lines 37-58), nor any other part of Suzuki-916, discuss driving an AC electrostatic actuator with a DC voltage. Furthermore, even if Suzuki-916 did show this, its combination with Higuchi would still render Higuchi unsatisfactory for its intended purpose, as discussed above.

Likewise, even if Hoen et al., Hirose et al., and Nishiguchi et al. did teach that electrostatic actuators can be driven by alternating or discrete voltage patterns or that discrete voltage patterns allow precise control over the mover, as asserted by the Examiner's Answer on page 7, these purported teachings are immaterial to Higuchi's intended purpose.<sup>1</sup> These

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<sup>1</sup> The Examiner's Answer fails to list Hirose et al. and Nishiguchi et al. under "Evidence Relied Upon" as required.



purported teachings do not change Higuchi's intended purpose nor the fact that the combination with Suzuki-916 would violate this purpose.

Moreover, the Examiner's Answer's citation to Suzuki-987 Figure 3 is incorrect. The Examiner's Answer states that Suzuki-987 Figure 3 shows the "U and V phase electrodes are driven by an AC (alternating current), which is provided by a DC source 25." This is false. Figure 3 of Suzuki-987 does not show the U and V phase electrodes driven by an alternating current. Rather, Figure 3 of Suzuki-987 shows the voltage of the U and V phase electrodes moving between a positive "+" high voltage and a negative "-" high voltage. See Suzuki-987 paragraph 0030-0031. Figure 3 does not show alternating current nor is there any discussion of alternating current in the corresponding paragraphs. Furthermore, by definition, a DC (*i.e.*, direct current) source cannot provide an alternating current, as asserted by the Examiner's Answer. As a result, the Examiner's argument must fail.

**B. The Examiner's Answer Fails To Overcome Appellants' Demonstration That The Final Office Action Fails To Show, And Indeed Cannot Show, That The Proposed Motivation To Combine Higuchi And Suzuki-916 Is In The References**

As shown in the Appeal Brief, the law requires that the suggestion or motivation to combine must be in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See, p. 12 (citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1988)). The Appeal Brief noted that the Final Office Action stated the alleged motivation to combine is "to provided [sic] smooth movement of the mover." *Id.* Appellants further noted that the Examiner fails to show that the alleged motivation to combine is in the references themselves and does not allege that the motivation to combine is in the knowledge generally available to one of ordinary skill in the art.

In response, the Examiner's Answer states that Suzuki-916 provides "literal" motivation to combine in that "the DC Voltage to provide [sic] five types of combinations in polarities and voltages to control the movement of the mover left and right in a smooth movement." See p. 8. This is basically a re-statement of the purported motivation provided in the Final Office Action and is dealt with in the Appeal Brief and below.

The Examiner's Answer further states that "Higuchi provides literal motivation...because it teaches the improvement of the reduced stress, improved force density, and compact arrangement are structural improvements to the electrostatic actuator

which are not tied to the driving waveform.” See pp. 8-9. This purported motivation was not stated in the Final Office Action and may not be relied upon now to overcome the defects in the Final Office Action. Furthermore, this statement is false and the purported motivation is not provided by Higuchi. Higuchi does not teach that its improvements “are not tied to the driving waveform.” No where in the cited paragraph, paragraph 0038, or elsewhere does Higuchi teach that its improvements “are not tied to the driving waveform.” Indeed, as shown above, the structural improvements include 3-phase or 4-phase electrodes the choice of which depends on whether a 3-phase or 4-phase alternating current is applied. See *Higuchi*, p. 34. Consequently, this purported motivation is not found in Higuchi and cannot be relied upon to overcome Appellants’ showing.

**1. The Examiner’s Answer Completely Misconstrues, And Fails to Address, Appellants’ Argument That The Examiner Failed To Provide Support Showing That Higuchi Does Not Have A Smooth Movement**

On page 9, the Examiner’s Answer states “Appellant’s argument that Suzuki cannot be combined with Higuchi because Higuchi does not discuss the smoothness is not persuasive.” This statement completely misrepresents the Appellants’ argument. Appellants did not argue that Higuchi does not “discuss the smoothness.” Rather, Appellants argued that the Examiner must provide support showing that Higuchi does not have a smooth movement in order to show the purported motivation comes from the references themselves. See, *Appeal Brief*, p. 13. Appellants argued that the Examiner must provide this support in order to show that the asserted motivation to combine with Suzuki-916, “to provided [sic] smooth movement of the mover,” is applicable to Higuchi. *Id.* As noted in the Appeal Brief, Suzuki-916 cannot *provide* “a smooth movement” to Higuchi if Higuchi already has a smooth movement; therefore, a showing of no “smooth movement” in Higuchi is required. *Id.* Rather than attack the references, as implied by the Examiner’s Answer, Appellants stated (1) that the Examiner has failed to provide *any* support showing that Higuchi does not have a “smooth movement” and (2) that there is no teaching in Higuchi that its movement is not smooth. *Id.* Without such support, the Examiner has failed to show that the alleged motivation to combine is found in the references.

The Examiner’s Answer on page 9 also repeats an earlier mistake that was noted above. Namely, the Examiner’s Answer speaks of “an alternating current established from a DC source” (in arguing that “the combined teaching of Higuchi and Suzuki [Suzuki-916] teach an electrostatic actuator...that is driven with an alternating current established from a

DC source with discrete voltage levels...to provide smooth motion to the mover.”). As noted above, a DC (*i.e.*, direct current) source cannot provide an alternating current, by definition. The Examiner is utterly confusing alternating current with changing, discrete voltage levels provided by a direct current (DC) source. The Examiner’s citation to figure 9 in Suzuki-916 further illustrates this point: figure 9 illustrates discrete voltage levels changing over time from “+” high voltage to “-” in incremental steps. See Suzuki-916, col. 9, line 53 to col. 10, line 37. Figure 9 does not show alternating current.

**2. The Examiner’s Answer Fails To Overcome Appellants’ Showing That The Alleged Motivation To Combine Is Not Found In The References Themselves Because Higuchi Does Have A Smooth Movement**

The Examiner’s Answer statement that “Appellant’s argument that Higuchi already provides smooth movement is not persuasive” ignores the fact that the burden is on the Examiner to show that Higuchi does not provide smooth movement, as discussed above, and is, therefore, wrong. That Higuchi does not limit its alternating current to a smooth sine wave pattern is immaterial, as it is apparent that Higuchi’s AC voltages produce a smooth movement. As noted in the Appeal Brief, the moving force depends on the root mean square (rms) value of the applied AC voltage. The rms value of the AC voltage can be changed continuously and, therefore, an AC powered actuator will more likely provide smooth movement than a DC powered actuator with intermediate voltage levels. The Examiner’s Answer fails to address or disagree with this point and, therefore, fails to overcome Appellants’ showing that since Higuchi already uses an AC voltage pattern that produces a smooth movement, there is no need and hence no motivation to replace the AC voltage of Higuchi with the DC voltages of Suzuki-916. Since Higuchi already provides a smooth movement, the Examiner’s proposed motivation *cannot* be found in the references.

In fact, that an AC voltage source will produce a smooth movement is recognized by Suzuki-916 itself. Suzuki-916 also teaches an embodiment applying an AC voltage that provides a “smoothly varied” driving force and which *does not* apply the DC voltage pattern or DC intermediate voltages cited by the Final Office Action (see Suzuki-916 col. 16, lines 14-41). Since Suzuki-916 itself teaches that an AC voltage produces a smooth movement without the DC voltage pattern or DC intermediate voltages cited by the Final Office Action, the motivation to combine cannot be found in the references themselves.

The Examiner’s incorrect argument that Higuchi’s “low stress and high force density comes from the structure, not the waveform” is irrelevant to the above and Higuchi’s

providing of smooth movement. Likewise, the Examiner's repeated incorrect statements about Suzuki-916 providing an AC waveform with smooth movement and discrete steps as shown in figure 9, see above, are immaterial to Higuchi's providing smooth movement.

Without a motivation to combine, rejection of the claims as obvious is improper. As such, Appellants respectfully request that the rejection of claims 1, 3-7, 9, 14-17, 22 and 23 under 35 U.S.C. § 103(a) as being obvious over Higuchi in view of Suzuki 916 be vacated and reversed.

**C. The Examiner's Answer Fails to Address or Overcome Appellants' Arguments That The Proposed Further Combination With Suzuki-987 Is Likewise Improper And Cannot Be Maintained**

Claims 8, 10-12 and 18-21 are rejected as obvious over Higuchi and Suzuki-916 in further view of Suzuki-987. Since this rejection also relies on the improper combination of Higuchi and Suzuki-916, it also must fail for at least the same reasons provided above. Nothing in Suzuki-916 overcomes the teachings against combining found in Higuchi and Suzuki-987. Consequently, Appellants respectfully request that the rejection of claims 8, 10-12 and 18-21 are rejected as obvious over Higuchi and Suzuki-916 in further view of Suzuki-987 be vacated and reversed.

The Examiner's Answer fails to address Appellants' argument that the prior art teaches against combining Suzuki-987 with Higuchi. As noted in the Appeal Brief, Suzuki-987 teaches connecting every other or every third electrode to a conductor to provide enhanced driving force with DC voltages (see FIG. 1 and Abstract). *Appeal Brief*, p. 14. Since Higuchi is specifically designed to use three-phase (and four-phase) AC voltages, applying this connection pattern to Higuchi would render Higuchi unsatisfactory for its intended purpose and would change Higuchi's principle of operation. *Id.* Consequently, Appellants respectfully request that the rejection of claims 8, 10-12 and 18-21 are rejected as obvious over Higuchi and Suzuki-916 in further view of Suzuki-987 be vacated and reversed for these reasons as well.

**D. The Examiner's Answer Fails to Address or Overcome Appellants' Arguments That The Proposed Further Combination With Hoen Is Likewise Improper And Cannot Be Maintained**

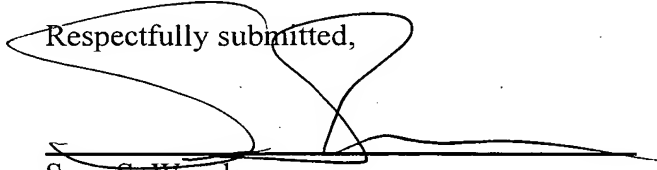
Claims 13 and 24 are rejected as obvious over Higuchi and Suzuki-916 in further view of Hoen. Since this rejection also relies on the improper combination of Higuchi and Suzuki-916, it also must fail for at least the same reasons provided above. Nothing in Hoen overcomes the teachings against combining found in Higuchi and Suzuki-916. Consequently,

Appellants respectfully request that the rejection of claims 13 and 24 are rejected as obvious over Higuchi and Suzuki-916 in further view of Hoen be vacated and reversed.

The Examiner's Answer fails to address Appellants' argument that Hoen's flexuresuspension, which is commonly used for MEMS actuators, simply does not apply to the large, layered-type actuators described by Higuchi. See *Appeal Brief*, pp. 14-15. Consequently, Appellants respectfully request that the rejection of claims 13 and 24 are rejected as obvious over Higuchi and Suzuki-916 in further view of Hoen be vacated and reversed.

Respectfully submitted,

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